CLAIMS

WHAT IS CLAIMED IS:

1. A planar lightwave circuit comprising:

a first portion of a waveguide;

a second portion of waveguide; and

a segment of crystal core fiber coupling the first portion of the waveguide with the second portion of the waveguide.

2. The planar lightwave circuit of claim 1 further comprising:

an optical index-matching gel disposed between the segment of crystal core fiber and the first portion and second portion of the waveguide.

3. The planar lightwave circuit of claim 1, wherein the segment of crystal core fiber has a principal optical axis disposed at approximately a 45-degree angle with the planar lightwave circuit.

4. The planar lightwave circuit of claim 1, wherein the planar lightwave circuit is an array waveguide grating.

5. The planar lightwave circuit of claim 4, wherein the segment of crystal core fiber is disposed at a mid section of the array waveguide grating.

6. The planar lightwave circuit of claim 5, wherein the segment of crystal core fiber is disposed in a V-groove substrate.

7. The planar lightwave circuit of claim 4, wherein the segment of crystal core fiber has a length that satisfies the equation $(2m+1) * \lambda / (2 * \Delta n)$, wherein m is any non-negative integer, λ is a wavelength of an optical signal in an optical communication waveband range, and Δn is a measure of birefringence of the segment of crystal core fiber.

8. The planar lightwave circuit of claim 7, wherein the optical communication waveband range is approximately 800 nm to 1700 nm.

9. The planar lightwave circuit of claim 7, wherein the segment of crystal core fiber comprises quartz, lithium niobate, lithium borate, beta-barium borate or other inorganic substance.

10. The planar lightwave circuit of claim 7, wherein the segment of crystal core fiber comprises an organic or polymeric substance.

11. An array waveguide grating comprising:

a plurality of waveguides;

a V-groove portion of substrate having multiple segments of crystal core fibers inserted into a section of the plurality of waveguides.

12. The array waveguide grating of claim 11 further comprising:

an optical index-matching gel disposed at ends of the multiple segments of crystal core fibers.

13. The array waveguide grating of claim 11, wherein the V-groove portion of substrate is inserted at a midway point of the array waveguide grating.

14. A method of correcting for birefringence in a planar lightwave circuit, the method comprising:

removing a section of the planar lightwave circuit; and

inserting a portion of crystal core fiber into the planar lightwave circuit.

15. The method of claim 14, wherein inserting the portion of crystal core fiber further comprises:

positioning the portion of crystal core fiber to have approximately a 45-degree angle between an optical axis of the portion of crystal core fiber and a substrate plane of the planar lightwave circuit.

16. The method of claim 15 further comprising:

inserting an index-matched gel between the portion of crystal core fiber and the planar lightwave circuit.

17. The method of claim 14, wherein the portion of crystal core fiber is disposed in a V-groove substrate.

18. The method of claim 17, wherein other portions of crystal core fiber are also disposed in the V-groove substrate.

19. A method of correcting for birefringence in a planar waveguide, the method comprising:

directing an optical signal down a first segment of the planar waveguide;

changing a polarization of the optical signal by directing the optical signal through a portion of crystal core fiber; and

directing the optical signal down a second segment of the planar waveguide.

20. The method of claim 19 further comprising:

reducing loss of the optical signal between an interface of the portion of crystal core fiber and the planar waveguide by using an index-matched gel.

21. The method of claim 19, wherein the length of the portion of crystal core fiber satisfies the equation (2m+1) * λ/ (2 * Δn), wherein m is a non-negative integer, λ is a wavelength of the optical signal, and Δn is a measure of birefringence of the portion of crystal core fiber.

22. The method of claim 21, wherein λ is in an optical waveband range of approximately 800 nm to 1700 nm.